Department of Agriculture, Trade and Consumer Protection
Division of Agricultural Development
Agricultural Development & Diversification Program (ADD)
Grant Project Final Report

Contract Number: 20019

Grant Project Title:Raspberry Breeding – The Development of New Commercial Cultivars for the Wisconsin Grower

Project Beginning Date: 7/01/04 Project End Date: 6/30/06

Amount of Funding Awarded: $10,000

Name of Principal Contact Person:Brian R. Smith

Address:Plant & Earth Science Dept., UW-River Falls, River Falls, WI 54022

Telephone: 715-425-3345 Fax Number: 715-425-3785

E-Mail Address: brian.r.smith@uwrf.edu

WEB Address:

Report Submitted on: 10/20/06

Please use the following questions as a guide for writing your grant project final report. In your final report, please answer each question as it relates to your grant project.

1) What did you want to accomplish with the grant?

Increase the scope of raspberry breeding at UW-River Falls, further test advanced selections, bring these selections close to cultivar status and begin release to Wisconsin commercial growers. Continue to evaluate/identify new cultivars for breeding potential. Educate growers on the importance of proper cultivar selection and proper culture of those selections to improve profitability. Develop greater interest in a core group that could help us continue our cultivar development and release efforts. By developing new, more adapted raspberry cultivars for Wisconsin, we will improve the profitability of existing growers and increase the likelihood that more new growers would conclude that commercial raspberry production in Wisconsin would be economically feasible. No other states in the Midwest have raspberry breeding programs, thus giving Wisconsin growers a competitive advantage.

2) What steps did you take to reach your goal?

All objectives were met. We established a very large trial 2 years ago that served as the backbone for testing our latest ’03 and ‘04 summer floricane-fruiting (**FF)** and fall primocane-fruiting (**PF**) selections from the UWRF breeding program and those from other breeding programs alongside industry standard cultivars. Not only were we be able to obtain valuable comparative data for decision-making on cultivar and/or breeding status of selections but the trial also is a source of plant materials for digging for breeding or to send to nurseries for increase.

The very large replicated raspberry trial planted in 2003 is fully established and we were able to collect data on **FF** cultivars and selections. This trial is the second largest replicated trial in the United States. The other

slightly smaller(but with considerably more breeding selections included) replicated trial planted in Summer 2004 has also established very well and was harvested. Our methods of propagation and establishment of our breeding selections and comparative cultivars has worked very well and we have been able to derive some excellent conclusions from our data. This allowed us to develop an updated list/description of recommended cultivars that is distributed to Wisconsin commercial growers. We also now have a better idea which cultivars are the best parents to be used in breeding and which selections should be eliminated or increased for breeding program use.

Five Aces Breeding was able to send us fully developed plugs and we established 863 seedlings last summer derived from 11 progenies at a 2' X 8' spacing, within and between rows, respectively. These seedlings were grown up to evaluation size this past summer and will be the primary field from which we select from in '07. Two years ago, we concluded we did not want to rely entirely on a private company as a primary support source to continue our breeding efforts. Therefore, we decided to supplement the breeding program by also working out in-house protocols for establishing our own seedling progenies, including breeding stock culture(potted stock outdoors and within the greenhouse), hybridization techniques, and timing of germination and seedling growth. Initial attempts to conduct hybridization in February and March "05 ended in the death of 30/45 parental stock plants. This loss was traced to a mix too high in peat, causing root rots. However, those that did survive, flowered well and we were able to produce 6 cross combinations, yielding approximately 2000 seed. In Spring '06, we were able to generate about 4000 seed from 10 cross combinations. We feel that we have been very successful in fine-tuning our parental potted stock culture and breeding protocols for the greenhouse since all hybridization efforts worked flawlessly this past spring of '06. We currently have 40 very well-established parental plants of 25 genotypes growing in 2-5 gal. pots for use in Winter '07 breeding. We also plan to dig approximately 20 more plants this fall from the large trials that have been established over the last 4 summers.

Multiple meetings were attended and presentations given regarding proper raspberry cultivar selection, our raspberry breeding efforts, and general commercial production techniques specifically related to new raspberry cultivars and selections.

We have one UW-River Falls selection, OAM-W2, being propagated by a national nursery for widespread release to growers for commercial field testing. In March '06, we contracted out for approximately 1200 plants to be custom tissue culture-propagated by Nourse Farms Nursery, Inc. and by June '06, there was enough interest generated by Wisconsin growers that another 600 were ordered. These plants will be ready by Spring '07 for establishment under commercial field conditions at multiple grower test sites.

What would you do differently?

Search for funding for permanent technician to allow us to plant seedlings and replicated trials earlier (April) so that we could obtain sufficient growth the first year to allow harvesting the following year.

3) What were you able to accomplish?

Our outreach efforts this past year included one national small fruit extension/ researcher meeting, (NCCC-22), two winter state-wide/regional commercial grower meetings, 2 area meetings/field days and one state Field Day. The national small fruit extension/research NCCCC-22 meeting was held in Geneva, NY, October 26-28, 2005. While this PI did not attend, the state research report that included all pertinent information regarding our raspberry breeding efforts and new selection(OAM-W2) was sent electronically and distributed to 45 participants across North America. This not only makes other state/government workers aware of our new cultivars and selections but also allows us to network and hopefully gain access to their breeding material. In conjunction with the WBGA (Wisconsin Berry Growers Association) we organized a 3-day regional commercial small fruit conference (part of an even larger conference including apple and vegetable growers) held January 8-10, 2006 at Oconomowoc. The raspberry growers there were exposed to our cooperator's efforts (Five Aces Breeding), and an update on UWRF raspberry breeding and cultivar testing results. Another presentation entitled " A Grower's Guide to Profitable Raspberry Production" was

given at the Bayfield Commercial Grower's Mini-Clinic on April 27, 2006. Again, many northern Wisconsin growers were in attendance, including some of our extension agents. The joint WBGA/Extension statewide Berry Field Day was held at the Zastrow's Farm near Mayville, WI on June 2, 2006. One of the educational efforts was to promote proper raspberry cultivar selection and inform growers of our new selections that will become available shortly.

A more detailed rendering of results from '05-'06 are described. These results were obtained in conjunction with WBGA and extension funding as supplemental to ADD and are as follows :

Raspberry Research Update

Brian R. Smith
University of Wisconsin-River Falls
Cooperator
Dr. Harry J. Swartz, "Five Aces Breeding"

Raspberry Breeding

General Program Objective:

Develop new floricane and primocane-fruiting cultivars with improved characteristics for commercial growers in the eastern and midwestern United States and Canada.

UW-River Falls Principal Objective and Role:

Serve as winter hardiness testing site for the WI/"Five Aces" Cooperative Bramble Breeding Program. Hybridization conducted at UW-River Falls and "Five Aces Breeding" in Maryland; seedlings germinated, grown to transplant size, and then field transplanted at UW-River Falls, and selected over a 2-4 year period. Propagation material duplicates of breeding and advanced selections sent to "Five Aces Breeding" for propagation via apical meristems/shoot tips (tissue culture) and for further hybridization use. Advanced selections sent to appropriate cooperating sites for further testing. Appropriate advanced selections with cultivar potential for Wisconsin are being tested at UW-River Falls.

Progress to Date

Support for this project has been provided by Five Aces Breeding, the WBGA (Wisconsin Berry Growers Association), NABGA, UW-System Applied Research Grant and the Wisconsin Department of Agriculture. This represents the 13th year of UW-River Falls involvement in the Cooperative Bramble Breeding Program. Over the years, a total of 11,421 seedlings have been planted at UW-River Falls from which 80 selections have been made. In Summer 2005, 863 seedlings were planted, representing 11 progenies. Seedlings are planted on a 2' x 8' spacing within and between rows, respectively. Advanced selections are planted in replicated or observational trials. Currently, all the bramble seedlings (1,689) planted since 2003 still remain in the field as sources from which to select for potential cultivar and breeding material.

Raspberry Genotype Performance Trials

A 3-replicate, 29-genotype, floricane/primocane bramble performance trial was established at UW-River Falls in 2003. Establishment specifics are as follows:

Location: University of Wisconsin-River Falls;
Climate**:** USDA Hardiness ZONE 3B (-4^0 guaranteed, -25^0 minimum average, -42^0F possible)
Average annual rainfall 29.95", Average snowfall – 48", Average growing season-120 days

Soil Type – Sparta Sandy Loam, 2.2% o.m., pH = 7.1
Planting - Bare root or tissue-cultured plants set June 16, 2003
Spacing - 2' x 8' within and between rows, respectively, 6 plants per plot. Plant density = 2,733 plants/acre
Irrigation - Sprinkler
Weed Control Mechanical/hand throughout first and second growing season.
Plant Type – Both bare-root cane stock and tissue-cultured.
Harvest season: Floricane-fruiting 7/5/05-7/28-05. Primocane-fruiting 9/1/05-9/24/05.

Observational plots were also established for the following advanced selections:

RF 01-99-10-5
RF 01-99-11-66
RF 01-99-12-3
RF 01-99-12-14
RF 01-99-12-17
RF 01-99-12-27
RF 01-99-12-32
RF 01-99-15-50
RF 01-99-17-13
RF 02-99-19-21

Floricane Fruiting Raspberry Genotype Performance Trials - Summer 2005
(Fruit/yield characteristics)

Genotype	Yield[z]	% Early Crop[y]	Fruit Size (g/fruit)	Rank
K81-6 (Nursery A)	7,100	8	3.3	1
Nova (Nursery B)	6,626	40	2.3	10
Festival	5,178	25	2.2	11
Boyne (Nursery A)	5,130	42	2.1	14
Killarney (Nursery A)	5,063	22	2.1	13
K81-6 (Nursery B)	4,994	0	3.0	4
Nova (Nursery A)	4,984	40	2.5	8
Royalty (Purple raspberry)	4,565	0	3.0	2
Killarney (Nursery B)	4,388	39	2.2	12
Boyne (Nursery B)	3,849	46	1.9	15
Encore	3,314	16	2.7	6
Prelude	2,041	100	1.8	17
PCS-1	2,035	100	1.8	16
Mac Black (Black raspberry)	1,607	0	1.7	19
NY 253	1,556	0	2.5	7
Esta	919	67	1.8	18
NY 283	830	0	2.4	9
NY 258	385	100	2.8	5
PCS-2	240	0	3.0	3

[z] grams/plot = lbs/Acre

[y] Determined by % of crop ripe by July 12 (3 possible harvests) compared to total (8 possible harvests) by July 28.

Floricane-Fruiting Raspberry genotype Performance Trials - Summer 2005
(Vegetative characteristics)

Genotype	Winter Hardiness[z]	Cane height (cm)	Incidence of Spines	Disease		
				Raspberry Leaf spot	Spur blight	Anthracnose
Boyne	5.0	175	2.0	1.5	3.0	2.0
Encore	2.5	187	4.75	3.0	3.0	4.75
Esta	2.0	205	4.5	3.0	4.5	4.0
Festival	4.5	128	5.0	1.7	4.75	5.0
K81-6	3.4	187	3.5	1.5	4.5	4.5
Killarney	4.5	163	2.0	2.5	4.0	4.5
NY 253	2.0	240	4.0	3.0	3.0	4.0
NY 258	1.75	195	4.0	1.75	4.5	2.25
NY 283	2.25	150	5.0	3.0	4.0	4.25
Nova	4.5	190	4.0	4.5	4.0	5.0
OAM-W2	3.9	175	4.0	4.0	4.0	4.0
PCS-1	3.0	205	4.25	4.0	4.0	3.5
PCS-2	1.75	230	3.75	3.0	4.0	4.0
Prelude	2.25	190	4.0	3.0	3.0	4.5

[z] Numerical ratings for winter hardiness, spine incidence and susceptibility to 3 diseases based on scale of 1 worst (hardiness-dead, dense spines, high disease incidence) to 5 best (most hardy, spineless, least diseases incidence).

2005 Raspberry Primocane-Fruiting Trial Results

Cultivar	Yield (lbs/acre)	Fruit Size 1st Harvest (gms)	Fruit Size Avg all harvests (gms)	1st Harvest Date	% Crop by Avg Frost Date (9/18)	Avg Height (in.)
Autumn Bliss	2,189	3.0	2.8	9/1	49	46
Autumn Britten (Nursery 1)	2,940	3.0	2.8	9/1	52	43
Autumn Britten (Nursery 2)	2,060	3.3	2.8	9/1	43	44
Autumn Byrd	1,130	2.5	2.1		44	47
Caroline (TC; Nursery)	3,862	3.5	3.0	9/1	53	66
Caroline (Nursery 2)	5,236	3.5	3.0	9/1	33	64
Dinkum	1,879	3.0	2.6	9/1	40	51
Heritage	4,023	2.9	2.1	9/6	43	60
Himbo Top	2,842	3.1	2.8	9/1	58	66

Joan J (TC)	2,363	3.4	2.8	9/1	41	61
Jacyln (QEG)	1,630	2.8	2.4	9/1	69	54
Polana (Nursery 1)	4,291	2.6	2.3	9/1	60	40
Polana (Nursery 2)	3,056	2.6	2.4	9/1	81	39
Ruby	1,895	3.6	2.7	9/1	45	56
Summit	2,453	1.9	1.6	8/25	54	48

2005 Primocane-Fruiting Raspberry Cultivar Harvest Concentration[z]

Cultivar	Yield Rank	Avg. production per day (lbs/A)
Heritage	3	251.4
Caroline (Nursery 2)	1	238.0
Polana (Nursery 1)	2	195.0
Caroline (TC, Nursery 1)	4	175.5
Polana (Nursery 2)	5	138.9
Autumn Britten (Nursery 1)	6	133.6
Himbo Top	7	129.2
Joan J	9	107.4
Autumn Bliss	10	99.5
Autumn Britten (Nursery 2)	11	93.6
Summit	8	87.6
Ruby	12	86.1
Dinkum	13	85.4
Jaclyn	14	74.1
Autumn Byrd	15	51.4

[z]Determined by dividing total yield by # of days in production.

A second replicated raspberry performance trial was established in Spring 2004; characterized by 12 ft. plots (6 plants/plot) and 3 replications of each genotype. These will be harvested in summer/fall 2006. The following genotypes were planted:

Red and Yellow Raspberries

Floricane-fruiting	Primocane-fruiting
Boyne	Anne
Encore	Autumn Bliss
Esquimalt (BC89-2-89)	Autumn Byrd
K81-6	Caroline
Killarney	Dinkum
Latham	Golden Harvest
Lauren	Golden Summit

Nova	Heritage
Reveille	Josephine
Tulameen	Kiwigold
WSU 1068	Magana
	Polana

Black Raspberries

Blackhawk
Bristol
Jewel

In addition to the above, single plots were established of the 20 raspberry selections made at UW-River Falls for 2003.

An observational evaluation bramble trial consisting of breeding program selections and industry-standard cultivars was established in summer 2005. The following genotypes were included:

Primocane Fruiters

RF 01-99-11-66, RF 01-99-12-17, RF 01-99-12-29, RF 01-99-15-50, RF 04-99-12-14, RF 04-02-10-8, RF 04-02-10-10, RF 04-02-8-3, RF 03-01-11-3, RF 04-02-8-58, RF 04-02-8-14, RF 04-02-UNK-38, RF 04-03-11-34, and accompanying commercial "check" cultivars, Autumn Bliss, Autumn Britten, Caroline, Polana and Heritage.

Floricane Fruiters

RF 04-01-3-30, RF 04-01-3-32, RF 04-01-3-26, RF 04-01-4-121, RF 03-01-4-58, RF 04-01-9-41, RF 04-01-9-43, RF 03-01-10-43, RF 04-01-16-99, RF 04-01-16-225, RF 04-01-UCR-240, RF 04-02-1-29, RF 04-02-1-100, RF 04-02-1-114, RF 04-02-5-24, RF 04-02-9-3, RF 04-02-9-106, RF 04-02-9-107, RF 04-02-9-108 and the accompanying commercial "check" cultivars Festival, Killarney, Latham and Nova.

Breeding/test stock from Kentville, Nova Scotia, British Columbia, Washington and Oregon were also planted, including K85-20, K93-1, K93-3, K93-9, K93-11, BC 89-34-41, BC 90-6-2, BC 90-8-11, Cascade Delight, Cascade Nectar, Chemainus, Cowichan, Esquimalt, WSU 1068, WSU 1112, and WSU 1162.

RECOMMENDED AND TRIAL RASPBERRY CULTIVARS
FOR WISCONSIN[z]
(Update January 2006)

Brian R. Smith
Department of Plant and Earth Science
University of Wisconsin-River Falls

RED FLORICANE-FRUITING (SUMMER BEARING)

EARLY SEASON[y]

*BOYNE (N & S)[x]	Vigorous, winter hardy and productive cultivar. Medium-sized dk. red fruit, medium glossy with small drupelets and average cohesion (average to soft). Aromatic, good flavor. Good for fresh or processing. Requires trellis. Above average yields in Wisconsin. Very susceptible to anthracnose and leaf spot. Tolerant to Phytophthora root rot.
NOVA (N & S)	Medium large bright red attractive fruit of good quality, somewhat acid. Good winter hardiness, few spines long fruiting laterals. High yields'05 - Wisconsin (UW-River Falls), high yields-Grand Rapids, MN. Good for PYO, fresh or freezing. Resistant to yellow rust. Good tolerance to Phytophthora root rot, spur blight, anthracnose, spur blight.
PRELUDE (NY 1009) (for trial N & S)	Primocane-fruiting but best advantage when planted for very early summer crop. Most trials indicate at least 50% of crop harvested by the time 'Killarney' begins. Slightly larger than 'Heritage'; bright red, very good quality, good drupelet coherence. Upright and vigorous growth and suckering. Low yields for summer crop ('05 River Falls); lower than 'Heritage' if growth for fall crop. Winter hardiness uncertain. Requires trellis. Resistant to Phytophthora root rot and tolerant to anthracnose.

EARLY MIDSEASON

FESTIVAL (N & S)	Very attractive bright red glossy medium-sized fruit with good skin strength and firm flesh. Very good for fresh market—only fair for freezing. Short but vigorous nearly spineless plants have good winter hardiness, immunity to mosaic virus and tolerance to spur blight and anthracnose. Susceptible to late leaf rust and Phytophthora root rot and very susceptible to raspberry leaf spot. Moderate to high yields in Wisconsin '05 (UW-River Falls).
*KILLARNEY (N & S)	A sibling of Boyne released from Manitoba. Medium-large very bright red fruit of good flavor (less acidic than 'Boyne') and freezing quality. Fruit tends to get soft in hot weather. Plants are medium height, spiny and produce many suckers. Susceptible to mildew and somewhat tolerant to Phytophthora root

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[z] Recommendations based on yield-evaluation-observation trials in Wisconsin, Minnesota, Michigan, Iowa and Illinois over the past 10 years. Growers should realize that this is a list of cultivars with potential in the state and not an endorsement of any specific cultivar for a specific site.

[y] Rated on fruiting season maturity based on multiple-year trials conducted in the Upper Midwest.

[x] Suggested for commercial plantings in N (northern) or S (southern) Wisconsin. Border between northern and southern Wisconsin can be visualized as a straight line drawn from LaCrosse to Marinette. Growers must use their best judgment on any microclimate exceptions and whether absolute cold temperature tolerance or fluctuating temperature tolerance may be more important in winter hardiness ratings. Northern or northeastern slopes are considered best for floricane-fruiting plantings and southern for primocane-fruiting cultivars. This is assuming suitable windbreaks are present and do not impede cold air drainage in case of frosts.

* Indicates popular commercial cultivar for region.

rot, anthracnose and spur blight. Very high yields in Wisconsin (UW-River Falls) and at Grand Rapids, MN. Requires trellis.

NORDIC (N) — Fruit medium size with lighter color, superior flavor, firmness and skin strength than 'Boyne'. Good frozen product. Plants can severely lack vigor in certain areas (require careful management of nutrition and water); have fewer spines and greater resistance to anthracnose than 'Boyne'. Resistant to Phytophthora root rot. Very good winter hardiness. Minimal trellis required. Low to moderate yields in Wisconsin and Minnesota.

REVEILLE (S) — Large soft fruit has very good flavor. Good for fresh but only fair frozen product. Vigorous heavily-suckering plants known for tolerance of fluctuating mid-winter temperatures. Insufficient tolerance to absolute cold—considerable winter injury after test winter, UW-River Falls. Average yields Wisconsin (UW-River Falls). Susceptible to Phytophthora root rot.

MIDSEASON

*CANBY (**only** for trial S) — Only for far southeastern Wisconsin. Even under uniform cold in Bayfield will sustain severe winter injury. Large light bright red fruit with very good, mildly acid flavor; acceptable firmness—suitable for fresh or frozen. Plants tall, large diameter canes, thornless. High yield potential. Will not tolerate poorly-drained sites (sus. To Phytophthora root rot).

K81-6 (for trial S) — Medium red conic, firm, very large , very good flavor. Resistant to powdery mildew and late yellow rust; tolerant to crown gall; susceptible to fruit rots, fire blight and Phytophthora root rot. Medium tall canes with few spines at base. Moderate to high yields-River Falls, WI. Some hardiness problems and poor yields at Grand Rapids, MN.

OAM-W2 (for trial N&S) — Selected at UW-River Falls. Developed through the MD, NJ, VA, WI Cooperative Bramble Breeding Program. Large, conical, bright red, cohesive, somewhat soft, flavorful fruit. Vigorous, medium-height canes. Sucker freely and have a moderate spine number. High yield potential. Slight injury in Winter '02-'03.

LATE MIDSEASON

*LATHAM (N) — Fruit ripens over long period. Bright attractive red medium-large roundish fruit somewhat crumbly and lacks quality for fresh; very good quality for canning and freezing. Vigorous productive plants with excellent winter hardiness. Requires trellis. Tolerant to several viruses and Phytophthora root rot. Poor to moderate yields (Grand Rapids, MN).

LATE

HAIDA (S, for trial N) — Firm fruit are larger, firmer, and sweeter than 'Boyne'. Very good fresh or processed; vigorous plants sucker prolifically; not quite as hardy as 'Boyne', very few spines. High yield potential. Second highest yield of 12 cultivars at UW-River Falls.

ENCORE (for trial N&S) — Probably latest of all red floricane - fruiters. Very large, attractive, uniform, coherent, firm fruit with well-balanced flavor - good for pre-picked or PYO markets. Vigorous plant with above-average root suckering and nearly spineless canes. Trellis is recommended. Even though 'Encore' has sturdy canes, its characteristic long fruiting laterals can be more efficiently harvested when given supplemental support. Sustains winter injury at UW-River Falls. Low yields '05 (River Falls, WI); low at Grand Rapids, MN. Very susceptible to Phytophthora root rot.

RECOMMENDED PURPLE RASPBERRY CULTIVARS

LATE

*BRANDYWINE
(S, for trial N) Large, reddish-purple fruit are firm and round-conical. Fair tart dessert quality, excellent for jams, jellies, freezing. Tall heavy canes with prominent thorns. Suckers originate only from crowns. High yield potential. Third highest yielding raspberry of 12 at UW-River Falls. Requires trellis.

*ROYALTY
(S, for trial N) Probably the best purple raspberry. Very large fruit somewhat soft but sweet and much better flavor than 'Brandywine'. Comparable to 'Brandywine' for processing - frozen product. Vigorous and very high yield potential. Top yielder out of 12 cultivars at UW-River Falls; moderate to high '05. Although has been considered less hardy by some than 'Brandywine', it actually had significantly less winter injury after test winter of 1993-1994. Requires trellis.

BLACK RASPBERRY CULTIVARS

None recommended due to inherent lack of winter hardiness of species to date.

RECOMMENDED PRIMOCANE-FRUITING (FALL-BEARING)
RASPBERRY CULTIVARS
FOR WISCONSIN

Following cultivars arranged in general order of fruiting season from earliest to latest. Regional and local variation in growing conditions can substantially change fruiting order.

SUMMIT (N) — Small to medium-sized firm, glossy bright red fruit with good cohesion and very good flavor. Excellent processed. Very early; usually 3 weeks ahead of 'Heritage' and even slightly earlier than 'Autumn Bliss' in some years. The very high early season yield potential offsets size problem in northern Wisconsin, but may not justify its use in southern Wisconsin. Very vigorous canes require trellis. Very susceptible to gray mold and raspberry leaf spot.

JACLYN (**for trial** N&S) — New release from the Five Aces/MD/NJ/VA/WI Cooperative Bramble Breeding Program. Large, dark-colored conical fruit are firm and cohesive, with excellent flavor/aroma and large size (1.5-2 X that of 'Heritage') and early low to moderate yields UW-River Falls ('04 & '05). Excellent heat and sunburn tolerance. Fruit somewhat difficult to remove in cool weather. In longer growing seasons, a second primocane crop occurs naturally about 8 weeks after the first crop. Susceptible to yellow rust.

POLANA (N&S) — Medium-sized, only fair, tart flavor, bright red glossy fruit. Much shorter canes than 'Heritage'. Good suckering capability. Quite variable in quality and performance depending on location; moderate to high yields at River Falls, WI and Grand Rapids, MN, but very high in Iowa! Difficult to harvest, plus many double fruits. Somewhat susceptible to gray mold; very susceptible to Phytophthora root rot.

DOUBLE DELIGHT (for trials N&S) — Morden, Manitoba recent intro. Very attractive medium bright red conical fruit w/ rounded apex. Size maintained well through several harvests. Excellent flavor. Reportedly in same season as 'Redwing' (10 days to 2 weeks earlier than 'Heritage'). Long stout canes with sparse prickles. Trellis recommended. Moderate to high yields (Grand Rapids, MN).

AUTUMN BRITTEN (for trials N&S) — One of the more promising new cultivars, especially since it is a sibling of 'Autumn Bliss'. Uniform medium to dark red; very large and firm (good drupelet cohesion). Tends to be very close to 'Autumn Bliss' in harvest season. Produces moderate to high yield (UW-River Falls, '04 & '05). Not as erect as sibling and quite sparse spines. Vigorous plants. Fruit better quality than 'Autumn Bliss'.

*AUTUMN BLISS (N&S) — The standard for fall-bearing raspberries in Wisconsin. Large oval-conic somewhat soft dull red to purplish-gray fruit have very good flavor. Probably the best primocane-fruiting cultivar for Wisconsin overall. Can begin ripening up to 3 weeks before 'Heritage' (August 10-15 in River Falls area). High yield potential for fall crop. (River Falls, WI and Grand Rapid, MN). Very susceptible to gray mold.

RED RIVER (for trials N&S) — Medium bright red, glossy and attractive; good drupelet coherence. Excellent flavor balance of sweet and tart qualities. Very winter hardy, short, stout canes with short sparse spines. Early fall crop; significantly earlier than 'Heritage' usually with 'Autumn Bliss'. However, small fruit size and only moderate yields (Grand Rapids, MN) will probably eliminate this cultivar as a commercial candidate.

RUBY (S, for trial N) — Very large conical glossy medium to dark red fruit. Average drupelet cohesion, uniformity and firmness. Tart but good flavor. Can begin ripening up to 3 weeks before 'Heritage' in River Falls area. Average vigor and cane suckering; root disease susceptibility mandates planting in well drained soil. Moderate to high yields at UW-River Falls and Benton Harbor, MI. Very susceptible to gray mold & Phytophthora root rot. Requires trellis.

CAROLINE
(N&S) From MD, NJ, VA, WI Coop. Bramble Breeding Program. Red, long conic, large with excellent flavor and shelf life. Usually softer than 'Heritage'. Good vegetative vigor, moderate suckering and typically higher yields than 'Heritage'. Long fruiting season. Better tolerance to yellow rust and root rots than 'Heritage'. Low incidence of gray mold. As firm as 'Heritage' at UW-River Falls and moderate to high yields ('04 & '05). High yields at Grand Rapids, MN. Tall, requires trellis.

ANNE
and
(for trial N&S) From MD, NJ, VA, WI Coop. Bramble Breeding Program. Large, attractive, light gold; excellent flavor and good firmness. Usually earlier than 'Heritage'. Good vegetative vigor and sparse suckering. Shy bearing! Tall; requires trellis. Very tolerant to Phytophthora root rot.

*HERITAGE
(S) 'Heritage' will usually not approach 'Autumn Bliss' yields anywhere in Wisconsin unless there is a late fall. Should not be planted on large scale unless grower has tested it against above cultivars on same site. 'Heritage' fruits are attractive, medium-sized, firm and bright red. Very good flavor and drupelet cohesion; vigorous, erect canes require a trellis. Susceptible to Phytophthora root rot.

4) What conclusions can you make based on project work and the analysis of collected data ?

The conclusions derived from the data are presented in the form of the "List of Recommended and Trial Raspberry Cultivars " provided earlier in this document. Other data (not shown), such as observational on breeding selections helps us determine which selections have cultivar potential, breeding potential, or neither(would be eliminated from the program). Regarding an overall picture of our project based on data collected, we are very encouraged about the progress made and the long-term "boost" that new cultivars will give to existing and potential fruit growers in Wisconsin.

5) What do you plan to do in the future as a result of this project?

Continue the raspberry breeding program with more crosses made at UW-River Falls. Continue to evaluate and release more cultivars for commercial growers and actively educate these growers regarding cultural strategies that will improve raspberry production reliability and productivity.

6) What information or additional resources are needed to commercially develop this enterprise ?

Continued support/assistance in locating and/or securing long term funding for this effort. Breeding programs Are some of the most cost effective strategies to not only bring new agricultural industries to the state but to also retain competitiveness with growers. As an example, in 1980, only the southern third of Wisconsin was growing soybeans due to unadapted varieties that would yield poorly and would not mature in our short, more northerly growing season. Plant breeders developed new, more adapted varieties and today we can grow soybeans in virtually every county in Wisconsin. Looking further back, 100 years ago, there was no winter-hardy alfalfa. Dr. N.E. Hansen from South Dakota State University went over to Siberia and brought back types that were more adapted and bred winter-hardy alfalfa for the upper Midwest. Where would our dairy industry be without alfalfa ?

7) How should the agricultural industry or the State of Wisconsin use the results from your grant project?

Continue to promote and assist in the expansion of commercial raspberry production by assisting in the education and business establishment of potential raspberry growers. Support continuing efforts at UW-River Falls to conduct research and outreach programs related to this economically important crop.